UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 27, 2002

MEMORANDUM TO: William D. Beckner, Program Director
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs, NRR

FROM: Eric J. Benner, Reactor System Engineer
Technical Specification Section
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs, NRR

SUBJECT: DRAFT PROPOSED CHANGES TO STANDARD TECHNICAL SPECIFICATIONS BASED ON DRAFT RULEMAKING FOR RISK-INFORMED 10 CFR 50.44, COMBUSTIBLE GAS CONTROL (TAC NO. MB1080)

The NRC is proposing to amend 10 CFR 40.44 to eliminate the requirement for hydrogen recombiners and to allow hydrogen and oxygen monitors to be commercial grade instead of safety grade. These changes stem from the Commission's ongoing effort to risk-inform its regulations. The staff will issue the proposed rule for public comment in the near future and intends to issue a model safety evaluation including proposed changes to the to the Improved Standard Technical Specification NUREGs (1430, 1431, 1432, 1433 and 1434) for public comment at the same time. The proposed changes to NUREGs 1430, 1431, 1432, 1433 and 1434 are attached.

Attachment: As stated

CONTACT:
E. Benner, NRR/RORP/DRIP
301-415-1171

February 27, 2002

MEMORANDUM TO: William D. Beckner, Program Director
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs, NRR

FROM: Eric J. Benner, Reactor System Engineer /RA/
Technical Specification Section
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs, NRR

SUBJECT: DRAFT PROPOSED CHANGES TO STANDARD TECHNICAL SPECIFICATIONS BASED ON DRAFT RULEMAKING FOR RISK-INFORMED 10 CFR 50.44, COMBUSTIBLE GAS CONTROL (TAC NO. MB1080)

The NRC is proposing to amend 10 CFR 40.44 to eliminate the requirement for hydrogen recombiners and to allow hydrogen and oxygen monitors to be commercial grade instead of safety grade. These changes stem from the Commission's ongoing effort to risk-inform its regulations. The staff will issue the proposed rule for public comment in the near future and intends to issue a model safety evaluation including proposed changes to the to the Improved Standard Technical Specification NUREGs (1430, 1431, 1432, 1433 and 1434) for public comment at the same time. The proposed changes to NUREGs 1430, 1431, 1432, 1433 and 1434 are attached.

Attachment: As stated

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301-415-1171

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DOCUMENT NAME: G:\RORP\Benner\50.44 TS Changes.wpd

OFFICE	TSS/DRIP:NRR	SC:TSS/DRIP:NRR	PD:RORP:DRIP:NRR
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DRAFT TECH SPEC CHANGES - DELETE SPEC AND ASSOCIATED BASES

3.6 CONTAINMENT SYSTEMS

3.6.8 Hydrogen Recombiners (Atmospheric, Subatmospheric, Ice Condenser, and Dual) (if permanently installed)

LCO 3.6.8 Two hydrogen recombiners shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One hydrogen recombiner inoperable.	A.1	---------- **- NOTE -** LCO 3.0.4 is not applicable. ---------- Restore hydrogen recombiner to OPERABLE status.	30 days
B. [Two hydrogen recombiners inoperable.	B.1	Verify by administrative means that the hydrogen control function is maintained.	1 hour AND Once per 12 hours thereafter
	AND		
	B.2	Restore one hydrogen recombiner to OPERABLE status.	7 days]
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 3.	6 hours

Attachment

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SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.6.8.1	Perform a system functional test for each hydrogen recombiner.	[18] months
SR 3.6.8.2	Visually examine each hydrogen recombiner enclosure and verify there is no evidence of abnormal conditions.	[18] months
SR 3.6.8.3	Perform a resistance to ground test for each heater phase.	[18] months

delete

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3.3 INSTRUMENTATION

3.3.3 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.3 The PAM instrumentation for each Function in Table 3.3.3-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

- NOTES -

1. LCO 3.0.4 is not applicable.
2. Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.7.	Immediately
C. ~~- NOTE - Not applicable to hydrogen monitor channels.~~ One or more Functions with two required channels inoperable.	C.1 Restore one channel to OPERABLE status.	7 days
~~D. Two hydrogen monitor channels inoperable.~~	~~D.1 Restore one hydrogen monitor channel to OPERABLE status.~~	~~72 hours~~

delete

delete

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Table 3.3.3-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITION REFERENCED FROM REQUIRED ACTION E.1
1. Power Range Neutron Flux	2	F
2. Source Range Neutron Flux	2	F
3. Reactor Coolant System (RCS) Hot Leg Temperature	2 per loop	F
4. RCS Cold Leg Temperature	2 per loop	F
5. RCS Pressure (Wide Range)	2	F
6. Reactor Vessel Water Level	2	G
7. Containment Sump Water Level (Wide Range)	2	F
8. Containment Pressure (Wide Range)	2	F
9. Penetration Flow Path Containment Isolation Valve Position	2 per penetration flow path[(a)(b)]	F
10. Containment Area Radiation (High Range)	2	G
~~11. Hydrogen Monitors~~	~~2~~	~~E~~ delete
12. Pressurizer Level	2	F
13. Steam Generator Water Level (Wide Range)	2 per steam generator	F
14. Condensate Storage Tank Level	2	F
15. Core Exit Temperature - Quadrant [1]	2[(c)]	F
16. Core Exit Temperature - Quadrant [2]	2[(c)]	F
17. Core Exit Temperature - Quadrant [3]	2[(c)]	F
18. Core Exit Temperature - Quadrant [4]	2[(c)]	F
19. Auxiliary Feedwater Flow	2	F

(a) Not required for isolation valves whose associated penetration is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

(c) A channel consists of two core exit thermocouples (CETs).

- REVIEWER'S NOTE -

Table 3.3.3-1 shall be amended for each unit as necessary to list:
1. All Regulatory Guide 1.97, Type A instruments and
2. All Regulatory Guide 1.97, Category I, non-Type A instruments in accordance with the unit's Regulatory Guide 1.97, Safety Evaluation Report.

BASES

LCO (continued)

for use by operators in determining the need to invoke site emergency plans. Containment radiation level is used to determine if a high energy line break (HELB) has occurred, and whether the event is inside or outside of containment.

delete

11. ~~Hydrogen Monitors~~

~~Hydrogen Monitors are provided to detect high hydrogen concentration conditions that represent a potential for containment breach from a hydrogen explosion. This variable is also important in verifying the adequacy of mitigating actions.~~

12. Pressurizer Level

Pressurizer Level is used to determine whether to terminate SI, if still in progress, or to reinitiate SI if it has been stopped. Knowledge of pressurizer water level is also used to verify the unit conditions necessary to establish natural circulation in the RCS and to verify that the unit is maintained in a safe shutdown condition.

13. Steam Generator Water Level (Wide Range)

SG Water Level is provided to monitor operation of decay heat removal via the SGs. The Category I indication of SG level is the extended startup range level instrumentation. The extended startup range level covers a span of $\geq$ 6 inches to $\leq$ 394 inches above the lower tubesheet. The measured differential pressure is displayed in inches of water at 68°F.

Temperature compensation of this indication is performed manually by the operator. Redundant monitoring capability is provided by two trains of instrumentation. The uncompensated level signal is input to the unit computer, a control room indicator, and the Emergency Feedwater Control System.

SG Water Level (Wide Range) is used to:

- identify the faulted SG following a tube rupture,
- verify that the intact SGs are an adequate heat sink for the reactor,

BASES

ACTIONS (continued)

applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM Function will be in a degraded condition should an accident occur. Condition C is modified by a Note that excludes hydrogen monitor channels.

D.1

- REVIEWER'S NOTE -

Implementation of WCAP-14986, Rev 1, "Post Accident Sampling System Requirements: A Technical Basis," and the associated NRC Safety Evaluation dated June 14, 2000, allows other core damage assessment capabilities in lieu of the Post Accident Sampling System.

delete –

Condition D applies when two hydrogen monitor channels are inoperable. Required Action D.1 requires restoring one hydrogen monitor channel to OPERABLE status within 72 hours. The 72 hour Completion Time is reasonable based on [the backup capability of the Post Accident Sampling System to monitor the hydrogen concentration for evaluation of core damage or other core damage assessment capabilities available and] to provide information for operator decisions. Also, it is unlikely that a LOCA (which would cause core damage) would occur during this time.

E.1

Condition E applies when the Required Action and associated Completion Time of Condition C or D are not met. Required Action E.1 requires entering the appropriate Condition referenced in Table 3.3.3-1 for the channel immediately. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met any Required Action of Condition C or D, and the associated Completion Time has expired, Condition E is entered for that channel and provides for transfer to the appropriate subsequent Condition.

F.1 and F.2

If the Required Action and associated Completion Time of Conditions C or D are not met and Table 3.3.3-1 directs entry into Condition F, the unit must be brought to a MODE where the requirements of this LCO do not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and MODE 4 within 12 hours.

DRAFT - DELETE SPEC & ASSOCIATED BASES

3.6 CONTAINMENT SYSTEMS

3.6.3.1 Primary Containment Hydrogen Recombiners (if permanently installed)

LCO 3.6.3.1 Two primary containment hydrogen recombiners shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One primary containment hydrogen recombiner inoperable.	A.1	---------- **- NOTE -** LCO 3.0.4 is not applicable. ---------- Restore primary containment hydrogen recombiner to OPERABLE status.	30 days
B. [Two primary containment hydrogen recombiners inoperable.	B.1	Verify by administrative means that the hydrogen control function is maintained.	1 hour AND One per 12 hours thereafter
	AND		
	B.2	Restore one primary containment hydrogen recombiner to OPERABLE status.	7 days]
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 3.	12 hours

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SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.6.3.1.1	Perform a system functional test for each primary containment hydrogen recombiner.	[18] months
SR 3.6.3.1.2	Visually examine each primary containment hydrogen recombiner enclosure and verify there is no evidence of abnormal conditions.	[18] months
SR 3.6.3.1.3	Perform a resistance to ground test for each heater phase.	[18] months

delete

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3.3 INSTRUMENTATION

3.3.3.1 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.3.1 The PAM instrumentation for each Function in Table 3.3.3.1-1 shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

- NOTES -

1. LCO 3.0.4 is not applicable.
2. Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.7.	Immediately
C. ~~- NOTE - Not applicable to [hydrogen monitor] channels.~~ One or more Functions with two required channels inoperable.	C.1 Restore one required channel to OPERABLE status.	7 days
~~D. Two [required hydrogen monitor] channels inoperable.~~	~~D.1 Restore one [required hydrogen monitor] channel to OPERABLE status.~~	~~72 hours~~

delete

delete

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Table 3.3.3.1-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITIONS REFERENCED FROM REQUIRED ACTION E.1
1. Reactor Steam Dome Pressure	2	F
2. Reactor Vessel Water Level	2	F
3. Suppression Pool Water Level	2	F
4. Drywell Pressure	2	F
5. Primary Containment Area Radiation	2	[G]
[6. Drywell Sump Level	2	F]
[7. Drywell Drain Sump Level	2	F]
8. Penetration Flow Path PCIV Position	2 per penetration flow path[(a) (c)]	F
9. Wide Range Neutron Flux	2	F
10. Drywell H_2 & O_2 Analyzer	2	F
11. Containment H_2 & O_2 Analyzer	2	F
12. Primary Containment Pressure	2	F
13. [Relief Valve Discharge Location] Suppression Pool Water Temperature	2[(c)]	F

delete

(a) Not required for isolation valves whose associated penetration flow path is isolated by at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

(c) Monitoring each [relief valve discharge location].

- REVIEWER'S NOTE -

Table 3.3.3.1-1 shall be amended for each plant as necessary to list:
1. All Regulatory Guide 1.97, Type A instruments and
2. All Regulatory Guide 1.97, Category 1, non-Type A instruments specified in the plant's Regulatory Guide 1.97, Safety Evaluation Report.

BASES

LCO (continued)

position indication in the control room to be OPERABLE for each active PCIV in a containment penetration flow path, i.e., two total channels of PCIV position indication for a penetration flow path with two active valves. For containment penetrations with only one active PCIV having control room indication, Note (b) requires a single channel of valve position indication to be OPERABLE. This is sufficient to verify redundantly the isolation status of each isolable penetration via indicated status of the active valve, as applicable, and prior knowledge of passive valve or system boundary status. If a penetration is isolated, position indication for the PCIV(s) in the associated penetration flow path is not needed to determine status. Therefore, the position indication for valves in an isolated penetration is not required to be OPERABLE. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed for each inoperable penetration flow path.

[For this plant, the PCIV position PAM instrumentation consists of the following:]

9. Wide Range Neutron Flux

Wide range neutron flux is a Category I variable provided to verify reactor shutdown.

[For this plant, wide range neutron flux PAM instrumentation consists of the following:]

delete

10. 11. Drywell and Containment Hydrogen and Oxygen Analyzer

Drywell and containment hydrogen and oxygen analyzers are Category I instruments provided to detect high hydrogen or oxygen concentration conditions that represent a potential for containment breach. This variable is also important in verifying the adequacy of mitigating actions.

[For this plant, the drywell and containment hydrogen and oxygen analyzers PAM instrumentation consists of the following:]

12. Primary Containment Pressure

Primary containment pressure is a Category I variable provided to verify RCS and containment integrity and to verify the effectiveness of ECCS actions taken to prevent containment breach. Two wide range primary containment pressure signals are transmitted from separate pressure

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BASES

ACTIONS (continued)

C.1

When one or more Functions have two required channels that are inoperable (i.e., two channels inoperable in the same Function), one channel in the Function should be restored to OPERABLE status within 7 days. The Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrument operation and the availability of alternate means to obtain the required information. Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM Function will be in a degraded condition should an accident occur. Condition C is modified by a Note that excludes hydrogen monitor channels. Condition D provides appropriate Required Actions for two inoperable hydrogen monitor channels.

D.1

delete

When two hydrogen monitor channels are inoperable, one hydrogen monitor channel must be restored to OPERABLE status within 72 hours. The 72 hour Completion Time is reasonable, based on the backup capability of the Post Accident Sampling System to monitor the hydrogen concentration for evaluation of core damage and to provide information for operator decisions. Also, it is unlikely that a LOCA that would cause core damage would occur during this time.

E.1

This Required Action directs entry into the appropriate Condition referenced in Table 3.3.3.1-1. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met any Required Action of Condition C or D, as applicable, and the associated Completion Time has expired, Condition E is entered for that channel and provides for transfer to the appropriate subsequent Condition.

F.1

For the majority of Functions in Table 3.3.3.1-1, if any Required Action and associated Completion Time of Condition C or D is not met, the plant

DRAFT - DELETE SPEC & ASSOCIATED BASES

3.6 CONTAINMENT SYSTEMS

3.6.3.1 Primary Containment Hydrogen Recombiners (if permanently installed)

LCO 3.6.3.1 Two primary containment hydrogen recombiners shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One primary containment hydrogen recombiner inoperable.	A.1	---------- - NOTE - LCO 3.0.4 is not applicable. ---------- Restore primary containment hydrogen recombiner to OPERABLE status.	30 days
B. [Two primary containment hydrogen recombiners inoperable.	B.1	Verify by administrative means that the hydrogen control function is maintained.	1 hour AND Once per 12 hours thereafter
	AND		
	B.2	Restore one primary containment hydrogen recombiner to OPERABLE status.	7 days]
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 3.	12 hours

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SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.6.3.1.1	Perform a system functional test for each primary containment hydrogen recombiner.	[18] months
SR 3.6.3.1.2	Visually examine each primary containment hydrogen recombiner enclosure and verify there is no evidence of abnormal conditions.	[18] months
SR 3.6.3.1.3	Perform a resistance to ground test for each heater phase.	[18] months

delete

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3.3 INSTRUMENTATION

3.3.3.1 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.3.1 The PAM instrumentation for each Function in Table 3.3.3.1-1 shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

- NOTES -

1. LCO 3.0.4 is not applicable.
2. Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.7.	Immediately
C. - NOTE - Not applicable to [hydrogen monitor] channels. One or more Functions with two required channels inoperable.	C.1 Restore one required channel to OPERABLE status.	7 days
D. Two [required hydrogen monitor] channels inoperable.	D.1 Restore one [required hydrogen monitor] channel to OPERABLE status.	72 hours

delete

delete

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Table 3.3.3.1-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITIONS REFERENCED FROM REQUIRED ACTION E.1
1. Reactor Steam Dome Pressure	2	F
2. Reactor Vessel Water Level	2	F
3. Suppression Pool Water Level	2	F
4. Drywell Pressure	2	F
5. Primary Containment Area Radiation	2	[G]
[6. Drywell Sump Level	2	F]
[7. Drywell Drain Sump Level	2	F]
8. Penetration Flow Path PCIV Position	2 per penetration flow path[(a) (b)]	F
9. Wide Range Neutron Flux	2	F
~~10. Drywell H_2 & O_2 Analyzer~~	~~2~~	~~F~~
~~11. Containment H_2 & O_2 Analyzer~~	~~2~~	~~F~~
12. Primary Containment Pressure	2	F
13. [Relief Valve Discharge Location] Suppression Pool Water Temperature	2[(c)]	F

delete

(a) Not required for isolation valves whose associated penetration flow path is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

(c) Monitoring each [relief valve discharge location].

- REVIEWER'S NOTE -

Table 3.3.3.1-1 shall be amended for each plant as necessary to list:
1. All Regulatory Guide 1.97, Type A instruments and
2. All Regulatory Guide 1.97, Category 1, non-Type A instruments specified in the plant's Regulatory Guide 1.97, Safety Evaluation Report.

BASES

LCO (continued)

indication to be OPERABLE. This is sufficient to redundantly verify the isolation status of each isolable penetration via indicated status of the active valve, as applicable, and prior knowledge of passive valve or system boundary status. If a penetration flow path is isolated, position indication for the PCIV(s) in the associated penetration flow path is not needed to determine status. Therefore, the position indication for valves in an isolated penetration flow path is not required to be OPERABLE. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed for each inoperable penetration flow path.

[For this plant, the PCIV position PAM instrumentation consists of the following:]

9. Wide Range Neutron Flux

Wide range neutron flux is a Category I variable provided to verify reactor shutdown. [For this plant, the wide range neutron flux PAM instrumentation consists of the following:]

10 11. Drywell and Containment Hydrogen and Oxygen Analyzers

Drywell and containment hydrogen and oxygen analyzers are Category I instruments provided to detect high hydrogen or oxygen concentration conditions that represent a potential for containment breach. This variable is also important in verifying the adequacy of mitigating actions. [For this plant, the drywell and containment hydrogen and oxygen analyzers PAM instrumentation consists of the following:]

12. Primary Containment Pressure

Primary containment pressure is a Category I variable provided to verify RCS and containment integrity and to verify the effectiveness of ECCS actions taken to prevent containment breach. Two wide range primary containment pressure signals are transmitted from separate pressure transmitters and are continuously recorded and displayed on two control room recorders. These recorders are the primary indication used by the operator during an accident. Therefore, the PAM Specification deals specifically with this portion of the instrument channel.

BASES

ACTIONS (continued)

C.1

When one or more Functions have two required channels that are inoperable (i.e., two channels inoperable in the same Function), one channel in the Function should be restored to OPERABLE status within 7 days. The Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrument operation and the availability of alternate means to obtain the required information. Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM Function will be in a degraded condition should an accident occur. Condition C is modified by a Note that excludes hydrogen monitor channels. Condition D provides appropriate Required Actions for two inoperable hydrogen monitor channels.

D.1

delete

When two hydrogen monitor channels are inoperable, one hydrogen monitor channel must be restored to OPERABLE status within 72 hours. The 72 hour Completion Time is based on the low probability of the occurrence of a LOCA that would generate hydrogen in amounts capable of exceeding the flammability limit; the length of time after the event that operator action would be required to prevent hydrogen accumulation from exceeding this limit; and the availability of the hydrogen recombiners, the Hydrogen Purge System, and the Post Accident Sampling System.

E.1

This Required Action directs entry into the appropriate Condition referenced in Table 3.3.3.1-1. The applicable Condition referenced in the Table is Function dependent. Each time an inoperable channel has not met any Required Action of Condition C or D, as applicable, and the associated Completion Time has expired, Condition E is entered for that channel and provides for transfer to the appropriate subsequent Condition.

F.1

For the majority of Functions in Table 3.3.3.1-1, if any Required Action and associated Completion Time of Condition C or D are not met, the

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B 3.6 CONTAINMENT SYSTEMS

B 3.6.3.3 Primary Containment Oxygen Concentration

BASES

BACKGROUND	All nuclear reactors must be designed to withstand events that generate hydrogen either due to the zirconium metal water reaction in the core or due to radiolysis. The primary method to control hydrogen is to inert the primary containment. With the primary containment inert, that is, oxygen concentration < 4.0 volume percent (v/o), a combustible mixture cannot be present in the primary containment for any hydrogen concentration. The capability to inert the primary containment and maintain oxygen < 4.0 v/o works together with the Hydrogen Recombiner System (LCO 3.6.3.1, "Primary Containment Hydrogen Recombiners") and the [Drywell Cooling System fans] (LCO 3.6.3.2, "[Drywell Cooling System Fans]") to provide redundant and diverse methods to mitigate events that produce hydrogen. For example, an event that rapidly generates hydrogen from zirconium metal water reaction will result in excessive hydrogen in primary containment, but oxygen concentration will remain < 4.0 v/o and no combustion can occur. Long term generation of both hydrogen and oxygen from radiolytic decomposition of water may eventually result in a combustible mixture in primary containment, except that the hydrogen recombiners remove hydrogen and oxygen gases faster than they can be produced from radiolysis and again no combustion can occur. This LCO ensures that oxygen concentration does not exceed 4.0 v/o during operation in the applicable conditions.
APPLICABLE SAFETY ANALYSES	The Reference 1 calculations assume that the primary containment is inerted when a Design Basis Accident loss of coolant accident occurs. Thus, the hydrogen assumed to be released to the primary containment as a result of metal water reaction in the reactor core will not produce combustible gas mixtures in the primary containment. Oxygen, which is subsequently generated by radiolytic decomposition of water, is recombined by the hydrogen recombiners (LCO 3.6.3.1) more rapidly than it is produced. Primary containment oxygen concentration satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii). 4. insert ↓ delete
LCO	The primary containment oxygen concentration is maintained < 4.0 v/o to ensure that an event that produces any amount of hydrogen does not result in a combustible mixture inside primary containment.

DRAFT - DELETE SPEC & ASSOCIATED BASES

3.6 CONTAINMENT SYSTEMS

3.6.8 Hydrogen Recombiners (Atmospheric and Dual) (if permanently installed)

LCO 3.6.8 [Two] hydrogen recombiners shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One hydrogen recombiner inoperable.	A.1	**- NOTE -** LCO 3.0.4 is not applicable. Restore hydrogen recombiner to OPERABLE status.	30 days
B. [Two hydrogen recombiners inoperable.	B.1	Verify by administrative means that the hydrogen control function is maintained.	1 hour AND Once every 12 hours thereafter
	AND		
	B.2	Restore one hydrogen recombiner to OPERABLE status.	7 days]
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 3.	6 hours

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SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.6.8.1	Perform a system functional test for each hydrogen recombiner.	[18] months
SR 3.6.8.2	Visually examine each hydrogen recombiner enclosure and verify there is no evidence of abnormal conditions.	[18] months
SR 3.6.8.3	Perform a resistance to ground test for each heater phase.	[18] months

delete

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3.3 INSTRUMENTATION

3.3.11 Post Accident Monitoring (PAM) Instrumentation (Analog)

LCO 3.3.11 The PAM instrumentation for each Function in Table 3.3.11-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

- NOTES -

1. LCO 3.0.4 is not applicable.
2. Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.7.	Immediately
C. - NOTE - Not applicable to hydrogen monitor channels. One or more Functions with two required channels inoperable.	C.1 Restore one channel to OPERABLE status.	7 days
D. Two hydrogen monitor channels inoperable.	D.1 Restore one hydrogen monitor channel to OPERABLE status.	72 hours

delete

delete

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Table 3.3.11-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITIONS REFERENCED FROM REQUIRED ACTION E.1
1. [Logarithmic] Neutron Flux	2	F
2. Reactor Coolant System Hot Leg Temperature	2 per loop	F
3. Reactor Coolant System Cold Leg Temperature	2 per loop	F
4. Reactor Coolant System Pressure (wide range)	2	F
5. Reactor Vessel Water Level	2	[G]
6. Containment Sump Water Level (wide range)	2	F
7. Containment Pressure (wide range)	2	F
8. Penetration Flow Path Containment Isolation Valve Position	2 per penetration flow path[(a)(b)]	F
9. Containment Area Radiation (high range)	2	[G]
~~10. Containment Hydrogen Monitors~~	~~2~~	~~F~~ delete
11. Pressurizer Level	2	F
12. Steam Generator Water Level (wide range)	2 per steam generator	F
13. Condensate Storage Tank Level	2	F
14. Core Exit Temperature - Quadrant [1]	2[(c)]	F
15. Core Exit Temperature - Quadrant [2]	2[(c)]	F
16. Core Exit Temperature - Quadrant [3]	2[(c)]	F
17. Core Exit Temperature - Quadrant [4]	2[(c)]	F
18. Auxiliary Feedwater Flow	2	F

(a) Not required for isolation valves whose associated penetration is isolated by at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

(c) A channel consists of two or more core exit thermocouples.

- REVIEWER'S NOTE -

Table 3.3.11-1 shall be amended for each unit as necessary to list:
1. All Regulatory Guide 1.97, Type A instruments and
2. All Regulatory Guide 1.97, Category I, non-Type A instruments specified in the unit's Regulatory Guide 1.97, Safety Evaluation Report.

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3.3 INSTRUMENTATION

3.3.11 Post Accident Monitoring (PAM) Instrumentation (Digital)

LCO 3.3.11 The PAM instrumentation for each Function in Table 3.3.11-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.
During movement of [recently] irradiated fuel assemblies.

ACTIONS

- NOTES -

1. LCO 3.0.4 not applicable.

2. Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.7.	Immediately
C. ~~- NOTE - Not applicable to hydrogen monitor channels.~~ One or more Functions with two required channels inoperable.	C.1 Restore one channel to OPERABLE status.	7 days
~~D. Two hydrogen monitor channels inoperable.~~	~~D.1 Restore one hydrogen monitor channel to OPERABLE status.~~	~~72 hours~~

delete

delete

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Table 3.3.11-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITIONS REFERENCED FROM REQUIRED ACTION E.1
1. [Wide Range] Neutron Flux	2	F
2. Reactor Coolant System Hot Leg Temperature	2 per loop	F
3. Reactor Coolant System Cold Leg Temperature	2 per loop	F
4. Reactor Coolant System Pressure (wide range)	2	F
5. Reactor Vessel Water Level	2	[G]
6. Containment Sump Water Level (wide range)	2	F
7. Containment Pressure (wide range)	2	F
8. Penetration Flow Path Containment Isolation Valve Position	2 per penetration flow path[(a)(b)]	F
9. Containment Area Radiation (high range)	2	[G]
~~10. Containment Hydrogen Monitors~~	~~2~~	~~F~~ delete
11. Pressurizer Level	2	F
12. Steam Generator Water Level (wide range)	2 per steam generator	F
13. Condensate Storage Tank Level	2	F
14. Core Exit Temperature - Quadrant [1]	2[(c)]	F
15. Core Exit Temperature - Quadrant [2]	2[(c)]	F
16. Core Exit Temperature - Quadrant [3]	2[(c)]	F
17. Core Exit Temperature - Quadrant [4]	2[(c)]	F
18. Emergency Feedwater Flow	2	F

(a) Not required for isolation valves whose associated penetration is isolated by at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

(c) A channel consists of two or more core exit thermocouples.

- REVIEWER'S NOTE -

Table 3.3.11-1 shall be amended for each unit as necessary to list:
1. All Regulatory Guide 1.97, Type A instruments and
2. All Regulatory Guide 1.97, Category I, non-Type A instruments specified in the unit's Regulatory Guide 1.97, Safety Evaluation Report.

BASES

LCO (continued)

8. Containment Isolation Valve Position

Containment Isolation Valve Position is provided for verification of containment OPERABILITY.

PCIV position is provided for verification of containment integrity. In the case of PCIV position, the important information is the isolation status of the containment penetration. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each active PCIV in a containment penetration flow path, i.e., two total channels of PCIV position indication for a penetration flow path with two active valves. For containment penetrations with only one active PCIV having control room indication, Note (b) requires a single channel of valve position indication to be OPERABLE. This is sufficient to redundantly verify the isolation status of each isolable penetration via indicated status of the active valve, as applicable, and prior knowledge of passive valve or system boundary status. If a penetration flow path is isolated, position indication for the PCIV(s) in the associated penetration flow path is not needed to determine status. Therefore, the position indication for valves in an isolated penetration flow path is not required to be OPERABLE. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed for each inoperable penetration flow path.

[For this unit, the PCIV position PAM instrumentation consists of the following:]

9. Containment Area Radiation (high range)

Containment Area Radiation is provided to monitor for the potential of significant radiation releases and to provide release assessment for use by operators in determining the need to invoke site emergency plans.

[For this unit, Containment Area Radiation instrumentation consists of the following:]

10. ~~Containment Hydrogen Monitors~~

~~Containment Hydrogen Monitors are provided to detect high hydrogen concentration conditions that represent a potential for~~

delete

BASES

LCO (continued)

~~containment breach. This variable is also important in verifying the adequacy of mitigating actions.~~

~~[For this unit, Containment Hydrogen instrumentation consists of the following:]~~

delete

11. Pressurizer Level

Pressurizer Level is used to determine whether to terminate safety injection (SI), if still in progress, or to reinitiate SI if it has been stopped. Knowledge of pressurizer water level is also used to verify the plant conditions necessary to establish natural circulation in the RCS and to verify that the plant is maintained in a safe shutdown condition.

[For this unit, Pressurizer Level instrumentation consists of the following:]

12. Steam Generator Water Level

Steam Generator Water Level is provided to monitor operation of decay heat removal via the steam generators. The Category I indication of steam generator level is the extended startup range level instrumentation. The extended startup range level covers a span of 6 inches to 394 inches above the lower tubesheet. The measured differential pressure is displayed in inches of water at 68°F. Temperature compensation of this indication is performed manually by the operator. Redundant monitoring capability is provided by two trains of instrumentation. The uncompensated level signal is input to the plant computer, a control room indicator, and the [Auxiliary Feedwater (AFW)] Control System.

At some plants, operator action is based on the control room indication of Steam Generator Water Level. The RCS response during a design basis small break LOCA is dependent on the break size. For a certain range of break sizes, the boiler condenser mode of heat transfer is necessary to remove decay heat. At these plants, extended startup range level is a Type A variable because the operator must manually raise and control the steam generator level to establish boiler condenser heat transfer. Operator action is initiated on a loss of subcooled margin. Feedwater flow is increased until the indicated extended startup range level reaches the boiler condenser setpoint.

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BASES

ACTIONS (continued)

Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrumentation operation and the availability of alternate means to obtain the required information. Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM Function will be in a degraded condition should an accident occur.

D.1

When two required hydrogen monitor channels are inoperable, Required Action D.1 requires one channel to be restored to OPERABLE status. This Required Action restores the monitoring capability of the hydrogen monitor. The 72 hour Completion Time is based on the relatively low probability of an event requiring hydrogen monitoring and the availability of alternative means to obtain the required information. Continuous operation with two required channels inoperable is not acceptable because alternate indications are not available.

delete

E.1

This Required Action directs entry into the appropriate Condition referenced in Table 3.3.11-1. The applicable Condition referenced in the Table is Function dependent. Each time Required Action C.1 or D.1 is not met, and the associated Completion Time has expired, Condition E is entered for that channel and provides for transfer to the appropriate subsequent Condition.

F.1 and F.2

If the Required Action and associated Completion Time of Condition C are not met, and Table 3.3.11-1 directs entry into Condition F, the plant must be brought to a MODE in which the requirements of this LCO do not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 4 within 12 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

LCO (continued)

PCIV position is provided for verification of containment integrity. In the case of PCIV position, the important information is the isolation status of the containment penetration. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each active PCIV in a containment penetration flow path, i.e., two total channels of PCIV position indication for a penetration flow path with two active valves. For containment penetrations with only one active PCIV having control room indication, Note (b) requires a single channel of valve position indication to be OPERABLE. This is sufficient to redundantly verify the isolation status of each isolable penetration via indicated status of the active valve, as applicable, and prior knowledge of passive valve or system boundary status. If a penetration flow path is isolated, position indication for the PCIV(s) in the associated penetration flow path is not needed to determine status. Therefore, the position indication for valves in an isolated penetration flow path is not required to be OPERABLE. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate condition entry is allowed for each inoperable penetration flow path.

[For this unit, the PCIV position PAM instrumentation consists of the following:]

9. Containment Area Radiation (high range)

Containment Area Radiation is provided to monitor for the potential of significant radiation releases and to provide release assessment for use by operators in determining the need to invoke site emergency plans.

[For this unit, Containment Area Radiation instrumentation consists of the following:]

delete

10. Containment Hydrogen Monitors

Containment Hydrogen Monitors are provided to detect high hydrogen concentration conditions that represent a potential for containment breach. This variable is also important in verifying the adequacy of mitigating actions.

[For this unit, Containment Hydrogen instrumentation consists of the following:]

BASES

ACTIONS (continued)

limits the risk that the PAM Function will be in a degraded condition should an accident occur.

D.1

When two required hydrogen monitor channels are inoperable, Required Action D.1 requires one channel to be restored to OPERABLE status. This Required Action restores the monitoring capability of the hydrogen monitor. The 72 hour Completion Time is based on the relatively low probability of an event requiring hydrogen monitoring and the availability of alternative means to obtain the required information. Continuous operation with two required channels inoperable is not acceptable because alternate indications are not available.

delete

E.1

This Required Action directs entry into the appropriate Condition referenced in Table 3.3.11-1. The applicable Condition referenced in the Table is Function dependent. Each time Required Action C.1 or D.1 is not met, and the associated Completion Time has expired, Condition E is entered for that channel and provides for transfer to the appropriate subsequent Condition.

F.1 and F.2

If the Required Action and associated Completion Time of Condition C are not met and Table 3.3.11-1 directs entry into Condition F, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

[G.1

At this plant, alternate means of monitoring Reactor Vessel Water Level and Containment Area Radiation have been developed and tested. These alternate means may be temporarily installed if the normal PAM channel cannot be restored to OPERABLE status within the allotted time. If these alternate means are used, the Required Action is not to shut down the plant, but rather to follow the directions of Specification 5.6.7. The report provided to the NRC should discuss whether the alternate

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3.6 CONTAINMENT SYSTEMS

3.6.8 Hydrogen Recombiners (if permanently installed)

LCO 3.6.8 Two hydrogen recombiners shall be OPERABLE.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One hydrogen recombiner inoperable.	A.1	---------- **- NOTE -** LCO 3.0.4 is not applicable. ---------- Restore hydrogen recombiner to OPERABLE status.	30 days
B. [Two hydrogen recombiners inoperable.	B.1	Verify by administrative means that the hydrogen control function is maintained.	1 hour AND Every 12 hours thereafter
	AND		
	B.2	Restore one hydrogen recombiner to OPERABLE status.	7 days]
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 3.	6 hours

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SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.6.8.1	Perform a system functional test for each hydrogen recombiner.	[18] months
SR 3.6.8.2	Visually examine each hydrogen recombiner enclosure and verify there is no evidence of abnormal conditions.	[18] months
SR 3.6.8.3	Perform a resistance to ground test for each heater phase.	[18] months

delete

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3.3 INSTRUMENTATION

3.3.17 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.17 The PAM instrumentation for each Function in Table 3.3.17-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

- NOTES -

1. LCO 3.0.4 is not applicable.
2. Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more Functions with one required channel inoperable.	A.1	Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1	Initiate action in accordance with Specification 5.6.7.	Immediately
C. ~~- NOTE - Not applicable to hydrogen monitor channels.~~ delete One or more Functions with two required channels inoperable.	C.1	Restore one channel to OPERABLE status.	7 days
D. Two required hydrogen monitor channels inoperable. delete	D.1	Restore one required hydrogen monitor channel to OPERABLE status.	72 hours

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Table 3.3.17-1 (page 1 of 1)
Post Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1
1. Wide Range Neutron Flux	2	F
2. RCS Hot Leg Temperature	2 per loop	F
3. RCS Cold Leg Temperature	2 per loop	F
4. RCS Pressure (Wide Range)	2	F
5. Reactor Vessel Water Level	2	G
6. Containment Sump Water Level (Wide Range)	2	F
7. Containment Pressure (Wide Range)	2	F
8. Penetration Flow Path Containment Isolation Valve Position	2 per penetration flow path[(a)(b)]	F
9. Containment Area Radiation (High Range)	2	G
~~10. Containment Hydrogen Concentration~~	~~2~~	~~F~~
11. Pressurizer Level	2	F
12. Steam Generator Water Level	2 per SG	F
13. Condensate Storage Tank Level	2	F
14. Core Exit Temperature	2 independent sets of 5[(c)]	F
15. Emergency Feedwater Flow	2	F

delete

- REVIEWER'S NOTE -

Table 3.3.17-1 shall be amended for each unit as necessary to list all U.S. NRC Regulatory Guide 1.97, Type A instruments and all U.S. NRC Regulatory Guide 1.97, Category I, non-Type A instruments in accordance with the unit's U.S. NRC Regulatory Guide 1.97, Safety Evaluation Report.

(a) Not required for isolation valves whose associated penetration is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(b) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

(c) The subcooling margin monitor takes the average of the five highest CETs for each of the ICCM trains.

BASES

LCO (continued)

8. Containment Isolation Valve Position

PCIV position is provided for verification of containment integrity. In the case of PCIV position, the important information is the isolation status of the containment penetration. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each active PCIV in a containment penetration flow path, i.e., two total channels of PCIV position indication for a penetration flow path with two active valves. For containment penetrations with only one active PCIV having control room indication, Note (b) requires a single channel of valve position indication to be OPERABLE. This is sufficient to redundantly verify the isolation status of each isolable penetration via indicated status of the active valve, as applicable, and prior knowledge of passive valve or system boundary status. If a penetration flow path is isolated, position indication for the PCIV(s) in the associated penetration flow path is not needed to determine status. Therefore, the position indication for valves in an isolated penetration flow path is not required to be OPERABLE. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed for each inoperable penetration flow path.

[For this plant, the PCIV position PAM instrumentation consists of the following:]

9. Containment Area Radiation (High Range)

Containment Area Radiation (High Range) instrumentation is provided to monitor the potential for significant radiation releases and to provide release assessment for use by operators in determining the need to invoke site emergency plans. [For this unit, the Containment Area Radiation instrumentation consists of the following:]

delete

10. Containment Hydrogen Concentration

Containment Hydrogen Concentration instrumentation is provided to detect high hydrogen concentration conditions that represent a potential for containment breach. This variable is also important in verifying the adequacy of mitigating actions. [For this unit, the Containment Hydrogen Concentration instrumentation consists of the following:]

BASES

ACTIONS (continued)

B.1

Required Action B.1 specifies initiation of action described in Specification 5.6.7, that requires a written report to be submitted to the NRC. This report discusses the results of the root cause evaluation of the inoperability and identifies proposed restorative actions. This action is appropriate in lieu of a shutdown requirement since alternative actions are identified before loss of functional capability and given the likelihood of unit conditions that would require information provided by this instrumentation. The Completion Time of "Immediately" for Required Action B.1 ensures the requirements of Specification 5.6.7 are initiated.

C.1

When one or more Functions have two required channels inoperable (i.e., two channels inoperable in the same Function), one channel in the Function should be restored to OPERABLE status within 7 days. This Condition does not apply to the hydrogen monitor channels. The Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrumentation action operation and the availability of alternative means to obtain the required information. Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance of qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM Function will be in a degraded condition should an accident occur.

delete

D.1

When two required hydrogen monitor channels are inoperable, Required Action D.1 requires one channel to be restored to OPERABLE status. This action restores the monitoring capability of the hydrogen monitor. The 72 hour Completion Time is based on the relatively low probability of an event requiring hydrogen monitoring and the availability of alternative means to obtain the required information. Continuous operation with two required channels inoperable is not acceptable because alternate indications are not available.

E.1

Required Action E.1 directs entry into the appropriate Condition referenced in Table 3.3.17-1. The applicable Condition referenced in the